

**BAKER BAY
WEST CHANNEL
SEDIMENT QUALITY EVALUATION
REPORT**



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ACRONYMS

Ag	Silver
As	Arsenic
Cd	Cadmium
CoC	Contaminate of concern
Cr	Chromium
CRM	Columbia River Mile
Cu	Copper
DMEF	Dredge Material Evaluation Framework
EPA	Environmental Protection Agency
Hg	Mercury
J	Laboratory estimated value detected between MRL & MDL
MDL	Method Detection Limit
MLLW	Mean Lower Low Water
MRL	Method Reporting Limit
ND	Non-detected at MRL or MDL
NES	Newly Exposed Surface
Ni	Nickel
PAH	Polynuclear Aromatic Hydrocarbon
Pb	Lead
PCB	Polychlorinated Biphenyl
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RMT	Regional Management Team
Sb	Thallium
SL	Screening Level
Tier II	Physical (a) & Chemical (b) analyses
Tier III	Bioassay & Bioaccumulation analyses
TOC	Total Organic Carbon
TVS	Total Volatile Solids
U	Laboratory non-detect at MRL
USFWS	U. S. Fish & Wildlife Service
WDNR	Washington Department of Natural Resources
Zn	Zinc
Σ	Total value (i.e. DDT + DDE + DDD)

Table of Contents

ABSTRACT	2
INTRODUCTION.....	3
Sampling and Analysis Objectives.....	3
PREVIOUS STUDIES	3
CURRENT SAMPLING EVENT/DISCUSSION	3
RESULTS	4
Physical and Volatile Solids (ASTM methods).....	4
Metals (EPA method 6010/7471), Total Organic Carbon (EPA method 415.1).....	4
Pesticides/PCBs (EPA method 8080), Phenols, Phthalates and Miscellaneous Extractables (EPA method 8270).....	4
Polynuclear Aromatic Hydrocarbons (EPA method 8270C)	4
CONCLUSION.....	4
REFERENCES	6
Table 1: Physical Analysis and Volatile Solids.....	7
Table 2: Inorganic Metals and TOC	8
Table 3: Pesticides, PCBs, Phenols, & Phthalates.....	9
Table 4: Polynuclear Aromatic Hydrocarbons (PAHs), Low Molecular Weight Analytes.....	10
Table 5: Polynuclear Aromatic Hydrocarbons (PAHs) High Molecular Weight	11
Figure 1. West (Ilwaco) Channel Vicinity Map.....	12
Figure 2 : Sediment Station Locations to be Dredged in 2006, Baker Bay West Channel CM 0 to 2.0	13
Figure 3 : Sediment Station Locations, Baker Bay West Channel CM 0 to 2.0	14

**BAKER BAY
WEST CHANNEL
SEDIMENT EVALUATION REPORT**
Sampled June 28, 2006

ABSTRACT

Baker Bay is on the Washington side of the Columbia River and is traversed from the west by West Channel, a federally maintained navigation project, extending from the Columbia River project at River Mile (RM) 2.5, upstream to the entrance of Ilwaco Boat Basin. The channel is maintained to a depth of 16 feet, is 3.2 miles in length and maintained to a width of 150 to 200 feet. Ilwaco (East) Channel, which is not maintained, runs generally east from Ilwaco and intersects Chinook Entrance Channel east of East Sand Island.

This evaluation was conducted following procedures set forth in the Ocean Testing Manual and Inland Testing Manual, developed jointly by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency to assess dredged material. Guidelines used are those developed to implement the Clean Water Act and Marine Protection, Research and Sanctuaries Act. These national guidelines and associated local screening levels are those adopted for use in the regional Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF), November 1998.

A total of four (4) Ponar surface grab sediment samples were collected along the outer reach of the West Baker Bay Channel June 28, 2006. Station 062806-BBWC-P-01 contained "clay balls" which were sampled and analyzed separately. All samples were submitted for physical and chemical analyses including total volatile solids, metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, and polynuclear aromatic hydrocarbon.

Mean grain-size, excluding the 062806-BBWC-01B (clay balls), for all the samples was 0.305 mm (range 0.260mm to 0.362mm) with sand percent ranging from 94.26 to 98.97%. The clay ball sample had a mean of 0.254 mm from a triplicate analysis of the sample, percent sand was 77.5 % with 22.5 % finds. Volatile solids ranged from 0.62 % to 2.08 % for the clay ball sample. Material from the outer three stations was more uniform.

The chemical data indicates low levels of metals present in all samples analyzed, but levels do not approach their respective DMEF screening levels. All total DDT, PCB, PAH, and phthalates reporting levels were low, with mostly non-detect (ND) results reported. Phenol was detected in all samples but was also detected in the method blank at very low levels. Material from Baker Bay has not historically had a problem with the presence of significant levels of chemicals of concern and the material was determined to be suitable for unconfined in-water placement without further characterization. This study further supports the 2004 determination that the material to be dredged is suitable for unconfined in-water disposal without further testing.

**BAKER BAY
WEST CHANNEL
SEDIMENT EVALUATION REPORT**
Sampled June 28, 2006

INTRODUCTION

This report characterizes the sediment to be dredged at the Baker Bay West channel for the purposes of dredging and disposal. The sampling and analysis objectives are stated in the Sampling and Analysis Plan (SAP May 2006), and are also listed below. This report will outline the procedures used to accomplish these objectives.

Sampling and Analysis Objectives

- To characterize sediments in accordance with the DMEF manual.
- Collect, handle and analyze representative sediment samples, of the proposed dredging prism, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.
- Characterize sediments to be dredged for evaluation of environmental impact upon disposal.
- Conduct physical and chemical characterization of dredge prism.

PREVIOUS STUDIES

Baker Bay West Channel sediment quality investigations have been carried out at various yearly intervals since 1973, with the last investigation at Baker Bay being done in 2004. In 1987 testing for physical properties, bulk chemistry (including elutriate tests) and bioassays were conducted. Sediments were found to be acceptable for in-water disposal at a dispersive site to avoid any adverse effect that might be derived from ammonia concentrations that were detected during elutriate testing. The results of the physical and bulk chemical testing done in 1992, 1997, and 2004 showed the materials to be clean sands between CM 0.0 and 2.9; from CM 2.9 to the boat basin entrance the materials were fine-grained, all of which was suitable for unconfined in-water disposal.

CURRENT SAMPLING EVENT/DISCUSSION

A total of five (5) samples were collected from four (4) stations from the West Channel at Baker Bay, June 28, 2006 (see Figure 1 through 3 and Table 1). The samples were collected using a Ponar sampling device (P). All samples were submitted for physical and chemical analyses including total volatile solids, metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, and polynuclear aromatic hydrocarbon.

**BAKER BAY
WEST CHANNEL
SEDIMENT EVALUATION REPORT**
Sampled June 28, 2006

RESULTS

Physical and Volatile Solids (ASTM methods)

Five (5) samples were submitted for physical analyses, with the data presented in Table 1. Mean grain-size, excluding the 062806-BBWC-01B (clay balls), for all the samples was 0.305 mm (range 0.260mm to 0.362mm) with sand percent ranging from 94.26 to 98.97%. The clay ball sample had a mean of 0.254 mm from a triplicate analysis of the sample, percent sand was 77.5 % with 22.5 % finds. Volatile solids ranged from 0.62 % to 2.08 % for the clay ball sample. Material from the outer three stations was more uniform.

Metals (EPA method 6010/7471), Total Organic Carbon (EPA method 415.1)

Five (5) samples were submitted for metals and TOC testing, with the data presented in Table 2. The TOC ranged from 300 to 5,700 mg/kg (ppm) in the samples. The outer three stations had a mean TOC of 400 mg/kg (ppm). Low levels of some metals were detected, but did not approach the DMEF screening level (SL). The levels detected are consistent with historical levels of metals detected in the West Channel.

Pesticides/PCBs (EPA method 8080), Phenols, Phthalates and Miscellaneous Extractables (EPA method 8270)

Five (5) samples were submitted for pesticides/PCBs, phenols, phthalates and miscellaneous extractables. The chemical data indicates low levels of metals present in all samples analyzed, but levels do not approach their respective DMEF screening levels. All total DDT, PCB and phthalates reporting levels were low, with mostly non-detect (ND) results reported. Table 3 indicates those that were detected as well as total PCBs and 4-Methylphenol. Phenol was detected in all samples but was also detected in the method blank at very low levels.

Polynuclear Aromatic Hydrocarbons (EPA method 8270C)

Five (5) samples were submitted for semi-volatile analyses. Few "low molecular weight" or "high molecular weight" PAHs were detected in any samples. Total low PAHs was 3.5 ug/kg for 062806-BBWC-P-01B while total high PAH was 9.4 and 53.2 ug/kg for 062806-BBWC-P-01A and 062806-BBWC-P-01B, respectively.

CONCLUSION

This evaluation was conducted following procedures set forth in the Inland Testing Manual, developed jointly by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency to assess dredged material and the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF). The DMEF is a regional manual developed jointly with regional EPA, Corps, Oregon Department of Environmental Quality and Washington Departments of Ecology and Natural Resources. This document is a guideline for implementing the Clean Water Act

**BAKER BAY
WEST CHANNEL
SEDIMENT EVALUATION REPORT**
Sampled June 28, 2006

(40 CFR 230), Section 404 (b)(1). The screening levels used are those adopted for use in the DMEF, final November 1998. The DMEF tiered testing approach requires that material in excess of 20% fines and greater than 5% volatile solids, as well as any material with prior history or is suspected (“reason to believe”) of being contaminated, be subjected to physical (Tier IIa) as well as chemical (Tier IIb) analyses.

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The chemical data indicates low levels of metals present in all samples analyzed, but levels do not approach their respective DMEF screening levels. All total DDT, PCB, PAH, and phthalates reporting levels were low, with mostly non-detect (ND) results reported. Phenol was detected in all samples but was also detected in the method blank at very low levels. Material from Baker Bay has not historically had a problem with the presence of significant levels of chemicals of concern and the material was determined to be suitable for unconfined in-water placement without further characterization. This study further supports the 2004 determination that the material to be dredged is suitable for unconfined in-water disposal without further testing.

BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT
Sampled June 28, 2006

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BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT
 Sampled June 28, 2006

Table 1: Physical Analysis and Volatile Solids

Sample I.D.	Grain Size (mm)	Percent			
	Median	Gravel (Clam Shells)	Sand	Silt/Clay	Volatile Solids
062806-BBWC-P-01A	0.278	0	94.26	5.74	0.92
062806-BBWC-P-01B*	0.254**	0	77.5	22.5	2.08
062806-BBWC-P-02	0.362	0.4	98.0	1.60	0.67
062806-BBWC-P-03	0.324	0	98.59	1.41	0.67
062806-BBWC-P-04	0.260	0	98.97	1.03	0.62
Minimum	0.254	0	77.5	1.03	0.62
Maximum	0.362	0.4	98.97	22.5	2.08
* sample 01B were clay balls analyzed separately from the sand matrix represented by 01A; ** mean of triplicate analyses conducted on 01B					

BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT
 Sampled June 28, 2006

Table 2: Inorganic Metals and TOC

Sample I.D.	As	Cd	Sb	Cu	Pb	Ni	Ag	Zn	Hg	TOC
	mg/kg (ppm)									
062806-BBWC-P-01A	2.32	0.026	0.047	4.94	3.13	6.89	0.021	22.6	0.01	0.15
062806-BBWC-P-01B	2.89	0.125	0.074	9.14	5.00	7.97	0.057	32.3	0.394	0.57
062806-BBWC-P-02	2.20	<0.021	<0.042	3.61	1.87	5.30	0.018	16.0	<0.004	0.04
062806-BBWC-P-03	1.65	<0.025	<0.043	3.72	1.95	6.74	0.012	19.0	<0.004	0.06
062806-BBWC-P-04	1.67	0.030	<0.042	3.29	1.92	5.50	0.012	17.6	<0.004	0.03
Maximum	2.89	0.125	0.074	9.14	5.00	7.97	0.057	32.3	0.394	0.57
Screening level (SL)	57	5.1	150	390	450	140	6.1	410	0.41	
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).										

BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT
 Sampled June 28, 2006

Table 3: Pesticides, PCBs, Phenols, & Phthalates

Sample I.D.	ug/kg (ppb)				
	Phenol	4-Methylphenol	Total Phthalates	TPCBs	Total DDT
062806-BBWC-P-01A	3.6J	<3.7	11.0JB*	<2.1	<0.16
062806-BBWC-P-01B	6.5J	<4.3	24.3B*	<2.9	0.67
062806-BBWC-P-02	5.4J	<3.8	16.3JB*	<2.1	<0.16
062806-BBWC-P-03	5.0J	<3.8	11.1JB*	<2.1	<0.16
062806-BBWC-P-04	4.6J	<3.8	11.1JB*	<2.1	<0.41
Screen level (SL)	420	670	970-8,300	10	6.9
* Method Blank – 3.3J					

BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT
 Sampled June 28, 2006

Table 4: Polynuclear Aromatic Hydrocarbons (PAHs), Low Molecular Weight Analytes

Sample I.D.	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	2-Methyl naphthalene	Naphthalene	Phenanthrene	Total Low PAHs
	ug/kg (ppb)							
062806-BBWC-P-01A	<1.3	<1.8	<1.8	<2.2	<1.6	<1.7	<1.7	ND
062806-BBWC-P-01B	<1.5	<2.1	<2.1	<2.5	<1.8	<1.9	3.5J	3.5
062806-BBWC-P-02	<1.3	<1.9	<1.9	<2.3	<1.6	<1.7	<1.7	ND
062806-BBWC-P-03	<1.4	<1.9	<1.9	<2.3	<1.6	<1.7	<1.7	ND
062806-BBWC-P-04	<1.3	<1.8	<1.8	<2.2	<1.6	<1.7	<1.7	ND
Maximum	ND	ND	ND	ND	ND	ND	3.5J	3.5
Screen level (SL)	500	560	960	540	670	2,100	1,500	5,200
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit) J = Estimated value (reported values are above the MDL, but below the PQL).								

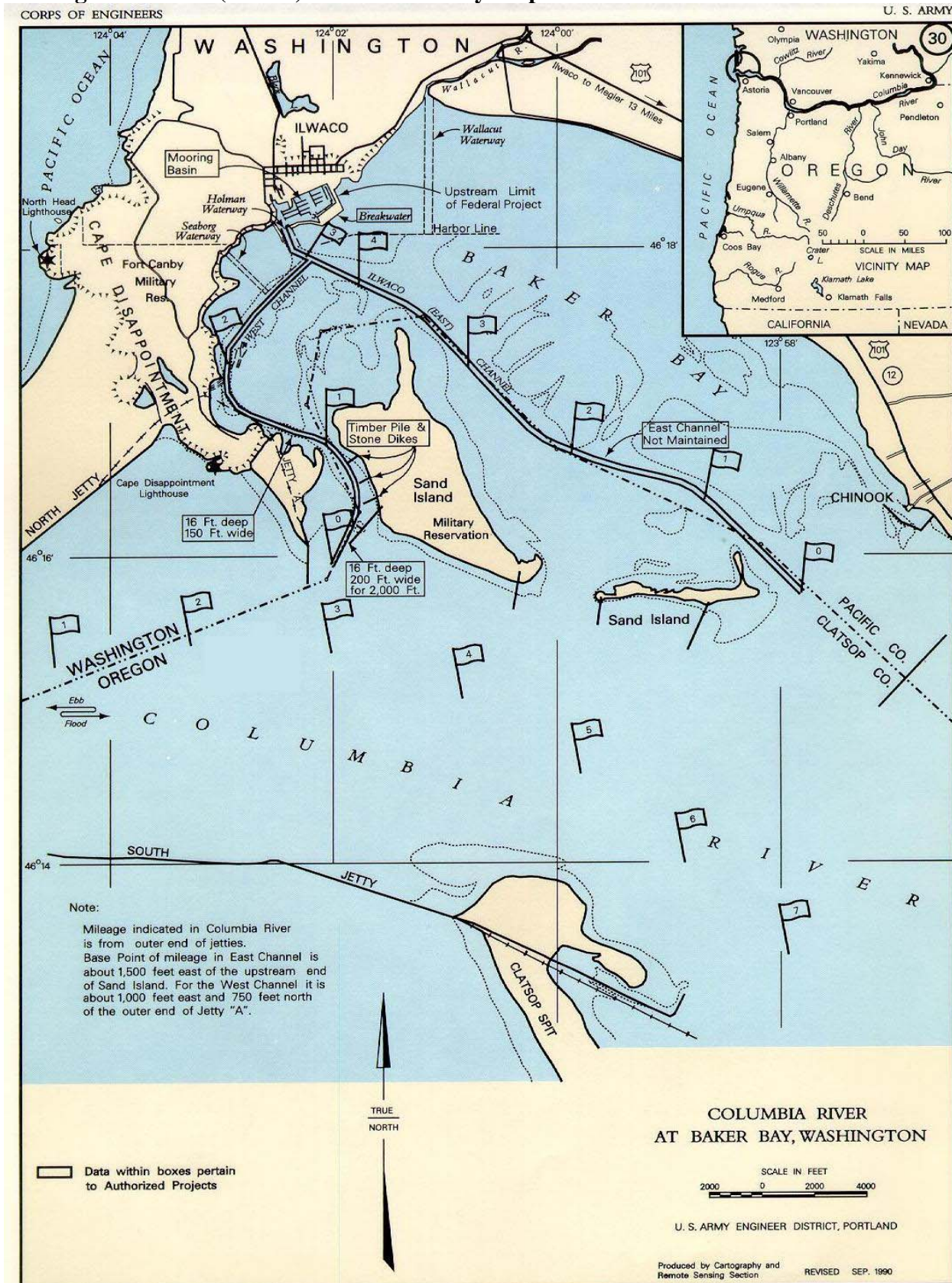
BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT
 Sampled June 28, 2006

Table 5: Polynuclear Aromatic Hydrocarbons (PAHs) High Molecular Weight

Sample I.D.	Benzo(a)-anthracene	Benzo-fluoranthene	Benzo-(g,h,i)-perylene	Chrysene	Pyrene	Benzo(a)-pyrene	Indeno-(1,2,3-cd)-pyrene	Dibenz(a,h)anthracene	Fluoranthene	Total High PAHs
	ug/kg (ppb)									
062806-BBWC-P-01A	<1.8	<3.2	<2.9	3.3J	4.0J	<2.1	<2.4	<2.8	5.4J	9.4
062806-BBWC-P-01B	4.9J	5.9J	3.8J	9.5	11	5.0J	3.9J	<3.3	9.2	53.2
062806-BBWC-P-02	<1.9	<3.3	<3.0	<1.9	<1.7	<2.1	<2.5	<2.9	<2.9	ND
062806-BBWC-P-03	<1.9	<3.3	<3.0	<1.9	<1.7	<2.1	<2.5	<2.9	<2.9	ND
062806-BBWC-P-04	<1.8	<3.3	<3.0	<1.8	<1.7	<2.1	<2.5	<2.9	<2.9	ND
Maximum	4.9J	5.9J	3.8J	9.5	11	5.0J	3.9J	ND	9.2	53.2
Screen level (SL)	1,300	3,200	670	1,400	2,600	1,600	600	230	1,700	12,000
J = Estimated value (reported values are above the MDL, but below the PQL). Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).										

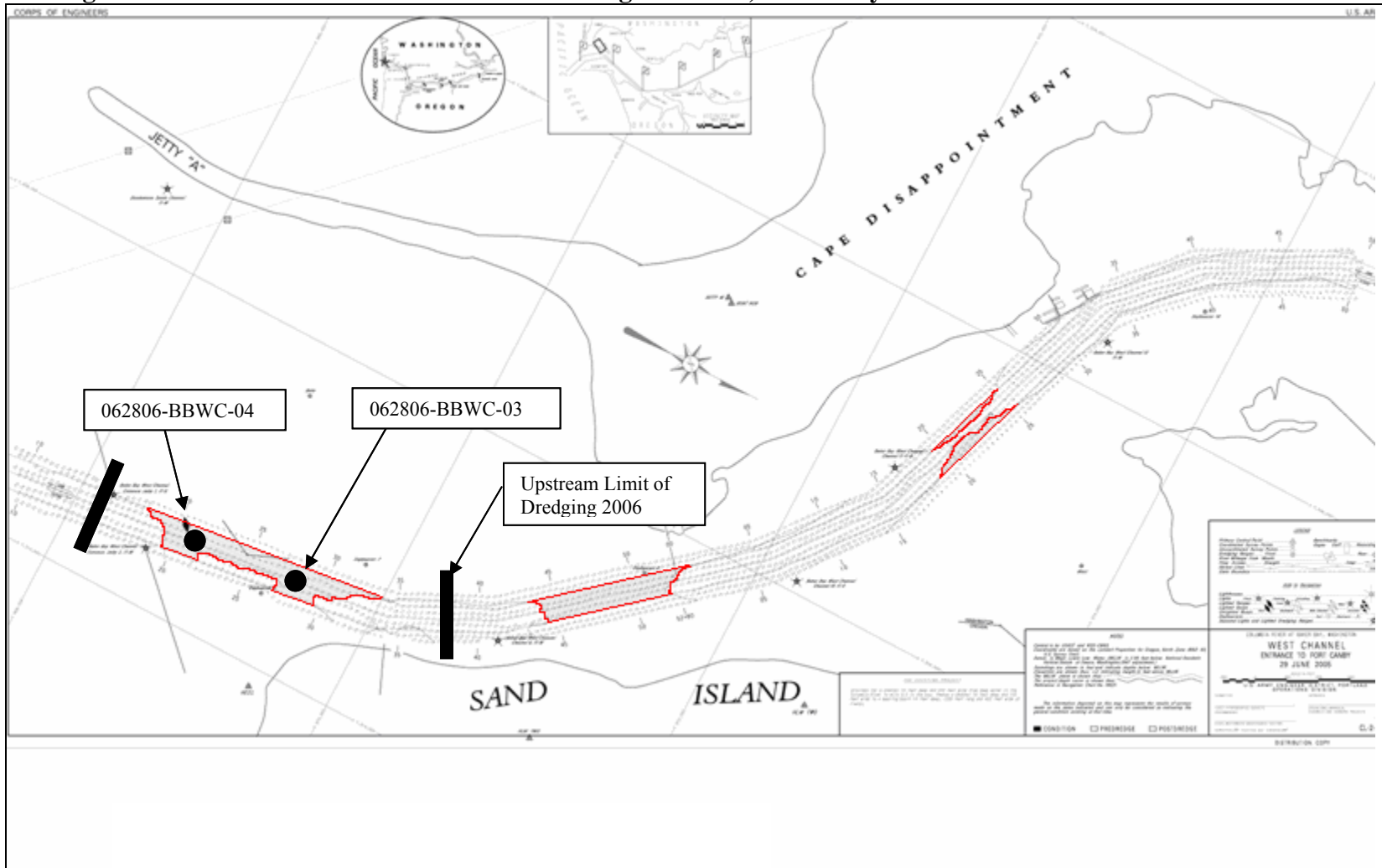
**BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT**
Sampled June 28, 2006

Figure 1. West (Ilwaco) Channel Vicinity Map



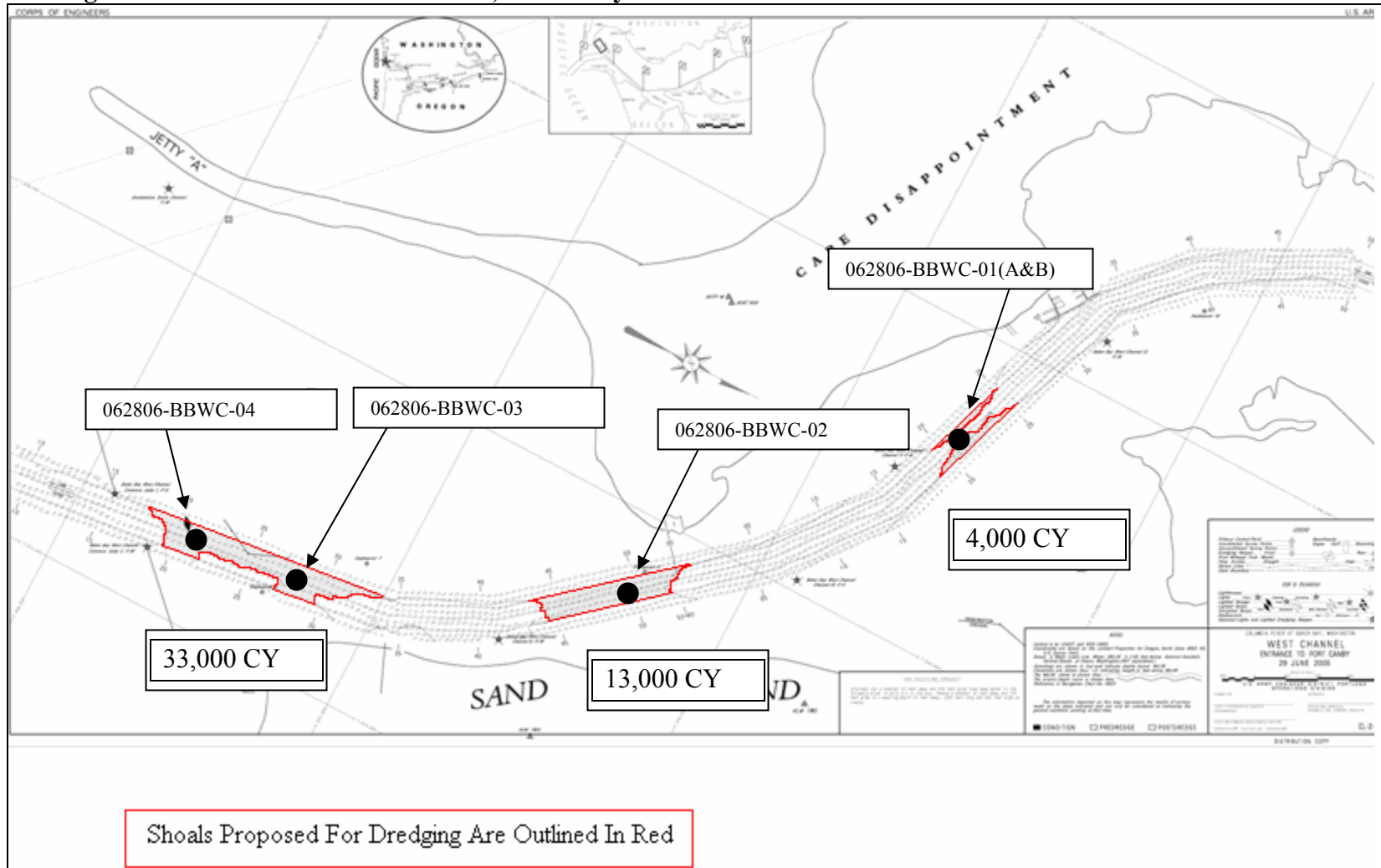
**BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT**
Sampled June 28, 2006

Figure 2 : Sediment Station Locations to be Dredged in 2006, Baker Bay West Channel CM 0 to 2.0



**BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT**
Sampled June 28, 2006

Figure 3 : Sediment Station Locations, Baker Bay West Channel CM 0 to 2.0



**BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT**
Sampled June 28, 2006



**BAKER BAY
WEST (ILWACO) ENTRANCE CHANNEL
SEDIMENT QUALITY EVALUATION REPORT**
Sampled June 28, 2006

